

WORLD-CLASS OUTSTANDING INTERNATIONAL
PROGRAM | EXHIBITION | NETWORKING

COMPRESSOR OIL FLOW CASE STUDY TEXAS A&M TURBOMACHINERY SYMPOSIUM

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29th Pump SYMPOSIA

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Abstract

This is a case study of a new motor-gear-compressor train installation in which the lube oil pressure became an issue during commissioning and startup. This case study will bring to light the hidden communication gaps that can occur in a new compressor installation. During commissioning and startup, the pressure control valve had to be opened to its maximum to barely achieve the minimum oil header pressure at the compressor deck. There was some type of short circuiting of the oil supply to the bearings.

This case study will present the actions taken to troubleshoot and resolve an apparent lube oil header pressure issue on a new installation. This case study will present the steps taken to troubleshoot the system which ultimately pointed to a missing thrust bearing orifice plate. An internal OEM communication gap proved to be the root cause of the short circuiting of the oil supply to the bearings.



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As-Built Conditions

- New motor-gear-compressor train installation
- Motor witness test run At motor OEM
- Gearbox witness test run at gearbox OEM
- Compressor witness test run at compressor OEM
- Lube oil console (LOC) witness test run at LOC OEM
- All test runs were successful.

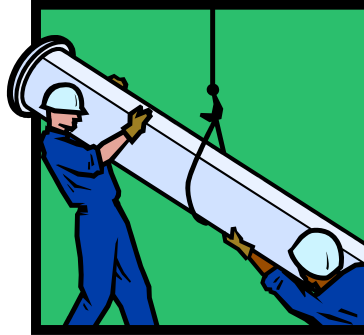


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Installation

- Field installation supervised by owner and general contractor
- Lube oil console inspected for cleanliness and debris
- Piping installed after inspections
- All deficiencies were corrected.
- No known issues prior to commissioning.

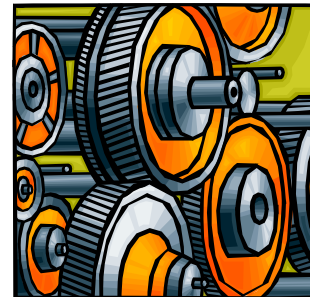


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Commissioning

- Oil pressure design target on compressor deck is 1.2 bar / 17.5 psig
- Upstream pressure control valve adjusted to its maximum travel to achieve only ~16.5-17 psig on the deck
- Excessive oil return flow observed in return sight glasses.
- Was the LOC undersized?
- Was the oil supply short circuiting the machine?



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Troubleshooting And Testing

- Thorough field inspection vs. the P&ID's was conducted. No issues were found.
- The LOC valve sizes were compared to design. No issues found.
- The LOC witness test run reports were reviewed. No obvious issues found.
- Rundown tank check valve was inspected and verified. No issues found.
- The lube oil pumps were inspected with rotation checks and pressure confirmation. No issues found.



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Troubleshooting And Testing

- Additional testing was needed.
- Ultrasonic oil flow tests were conducted on lube oil piping.
- Individual flows were measured at all available supply and return lines.
- Data results suggested excessive flow to the compressor thrust bearing.
- Oil flow to the thrust bearing was 2-3 x design.

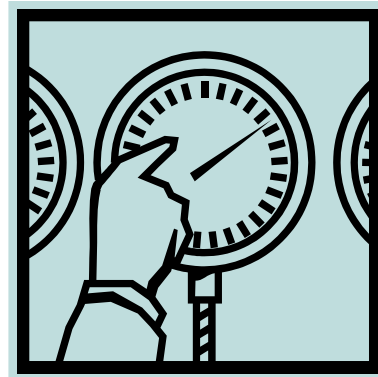


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Troubleshooting And Testing

- Reviewed ultrasonic oil flow data with the compressor OEM.
- Thrust bearing oil flow = 2-3 x design flow
- Other supply flows were within expected ranges
- Reviewed oil flow requirements and P&ID's vs. test stand report.
- Compressor test run at the OEM factory was based on an oil supply pressure of 0.4 bar / 6.09 psig.
- Actual lube oil system design based on 17.5 psig bearing supply pressure.

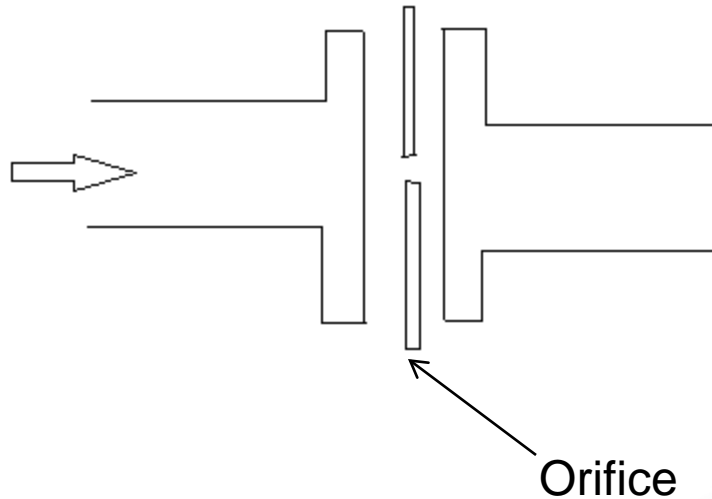


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Resolution

- Compressor OEM recommended an external orifice plate be added upstream of the thrust bearing.
- Dow agreed with the recommended solution and installed the orifice plate.
- Lube oil system restarted and pressures were found to be within the expected design parameters.
- The pressure control valve range was back within expected target.
- Compressor was successfully commissioned and started up.
- No oil leaks were observed.
- Vibration and bearing temperatures were acceptable.



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Lessons Learned

- Internal OEM communication gap existed due to multiple team player involvement (Auxiliary System Team Vs. Compressor Design Team, Geographical Distance, Etc.)
- Need to verify that the test stand lube oil pressure is in agreement with the train design during document reviews.
- Need to shop verify test stand conditions vs. job order as another check and balance.



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Questions?



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